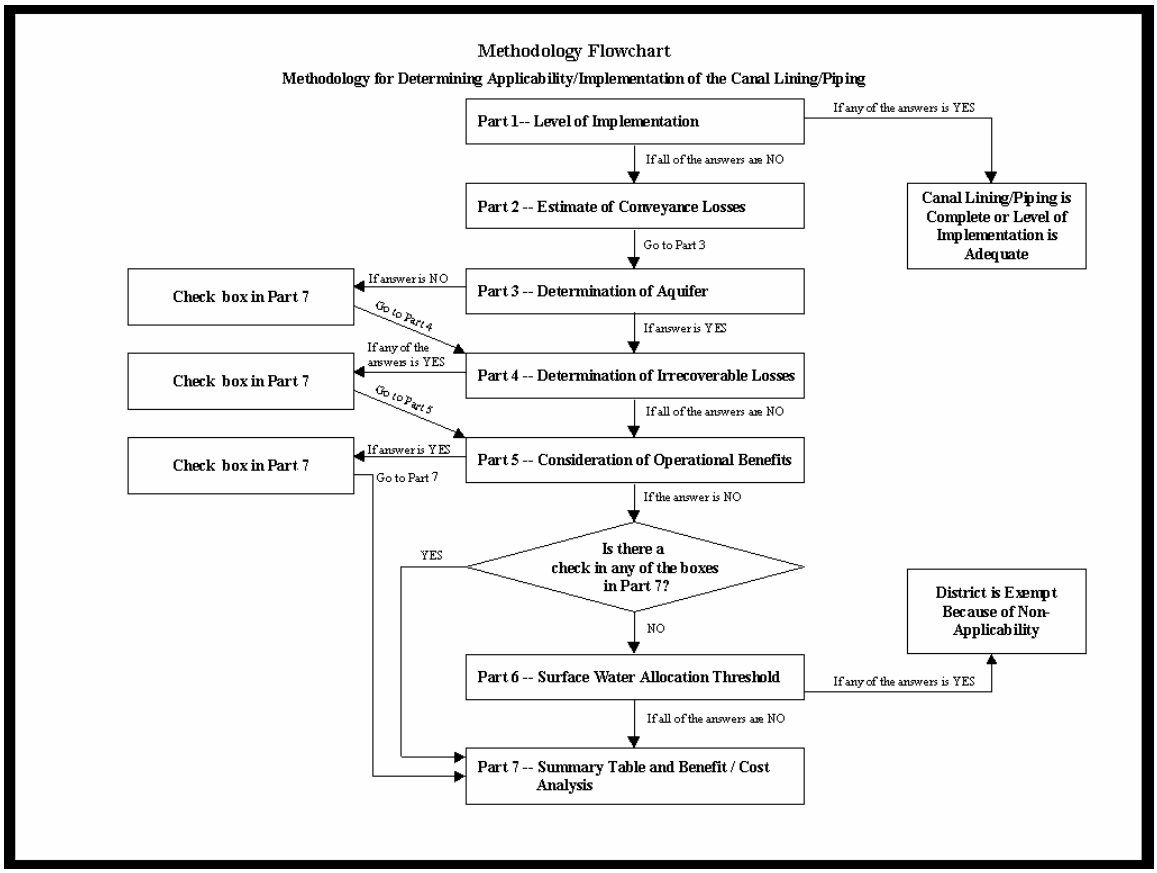
Methodology for Determining Applicability/Implementation of the Canal Lining/Piping

April 2000


Methodology Flowchart
Methodology for Determining Applicability/Implementation of the Canal Lining/Piping
Part 1-- Level of Implementation
If any of the answers is YES
Canal Lining/Piping is Complete or Level of Implementation is Adequate
If all of the answers are NO
Part 2 -- Estimate of Conveyance Losses
Go to Part 3
Part 3 -- Determination of Aquifer
If answer is NO
Check box in Part 7
Go to Part 4
If answer is YES
Part 4 -- Determination of Irrecoverable Losses
If any of the answers is YES
Check box in Part 7
Go to Part 5
If all of the answers are NO
Part 5 -- Consideration of Operational Benefits
If answer is YES
Check box in Part 7
Go to Part 7
If the answer is NO
Is there a check in any of the boxes in Part 7?
YES
NO
District is Exempt Because of Non-Applicability
Part 6 -- Surface Water Allocation Threshold
If any of the answers is YES
If all of the answers are NO
Part 7 -- Summary Table and Benefit / Cost Analysis

Methodology for Determining Applicability/Implementation

of the Canal Lining/Piping

The purpose of this methodology is to provide an analytical process for determining the applicability and potential implementation of the canal lining and/or piping as part of the *Lining/Piping* best management practice (BMP) for Central Valley Project (CVP) districts. The U.S. Bureau of Reclamation's (Reclamation) criteria for CVP Water Management Plans requires the consideration of lining or piping unlined conveyance systems as a water management practice.

Many of the districts in the CVP were formed for the purpose of providing surface water from major California river systems to over-drafted or water-short areas in California. The allocation of surface water to many of the districts is based on the practice of conjunctive use of surface water and groundwater supplies.

This methodology provides a streamlined analytical method for balancing the needs of CVP conjunctive use districts while giving due consideration to the canal lining and/or piping.. This methodology has been developed to facilitate the evaluation of the *Lining/Piping* by the district and Reclamation's review, but there may be cases where additional information may be requested. This methodology provides one method of addressing canal lining/piping and does not invalidate or eliminate other acceptable methods.

PART 1 Level of Implementation

YES NO *Is the district's distribution system already fully lined or piped?*

[If the district's distribution system is already fully lined or piped, this in itself is sufficient to justify canal lining/piping as being fully implemented. Lined sections of canals or pipelines which have aged or been damaged beyond their intended purpose should be considered equivalent to unlined canals. Supporting information should include a statement declaring that the district's distribution system is already fully lined or piped and in good repair.]

YES NO *Does the district already have an on-going canal lining/piping program?*

[If the district has already implemented a canal lining or canal-piping program, the district is already in compliance with requirements of this portion of the BMP. Supporting information should include a description of the program that has been implemented, the expected timeline of the program, and the estimated district costs]

If any of the answers above is YES, then provide supporting information. No further analysis of this methodology is required. The implementation of canal lining/piping.is complete or ongoing. If the district is currently implementing a canal lining or piping program, then the program is considered ongoing at an adequate level of implementation and reporting will be required in the annual update reports.

If all of the answers above are NO, then go to Part 2.

PART 2 Estimate of Conveyance Seepage

Table 1: Summary of Conveyance System and System Seepage.

Conveyance Type	Length (miles)	Estimated Conveyance Seepage (AF/YR)
Unlined Canal		
Lined Canal		
Piped		
Other:		

NOTE: Pipelines and lined sections of canals which have aged or been damaged beyond their intended purpose should be considered equivalent to "unlined canals" and listed under "Other:"

Table 2: Summary of Loss Recovery.

Conveyance Type	Estimated Conveyance Seepage Recovered (AF/YR)	Estimated Conveyance Seepage Lost to Service Area (AF/YR)	Estimated Conveyance Seepage Lost to Saline Sink (AF/YR)
Unlined Canal			
Lined Canal			
Piped			
Other:			

[The intent of these tables is to take an inventory of the district's facilities and determine the magnitude of estimated conveyance losses. Pumping records, water delivery records, analyzing soil types, and/or performing field tests can be used to estimate conveyance seepage.]

Go to Part 3.

PART 3 Determination of Aquifer

YES NO *Is the district in an area with usable groundwater from an unconfined aquifer?*

[Districts with conjunctive use or groundwater recharge programs typically overlie an unconfined aquifer. Conveyance seepage in areas without unconfined aquifers with usable groundwater are typically irrecoverable and/or create adverse impacts. The pumping of groundwater and/or recovery of percolated water must also be economically feasible for conjunctive use to be practicable. Supporting aquifer information may be available from studies and reports produced by Reclamation, Natural Resources Conservation Service, California Department of Water Resources, and/or other engineering projects.]

If YES, provide supporting information and go to Part 4.
If NO, place a check in the box in Part 7 and go to Part 4.

PART 4 Determination of Irrecoverable Losses

YES NO *Does conveyance seepage from the distribution system contribute to a subsurface drainage problem or become lost to a saline sink?*

[Conveyance seepage, which contribute to subsurface drainage problems or are lost to a saline sink, create irrecoverable losses and negative impacts. The extent and cost of the irrecoverable conveyance losses and the negative impacts generated must be considered and analyzed.]

YES NO *Over the long term, is the district's canal conveyance seepage greater than the estimated total groundwater extractions within the district boundaries?*

[Conveyance seepage in excess of the total groundwater extractions within the district's boundaries over the long-term average are generally lost to the district. These losses typically result in groundwater outflow from the district and are considered irrecoverable losses, although some third party benefits may be realized.]

If any of the answers above are YES, place a check in the box in Part 7 and go to Part 5.
If all answers above are NO, provide supporting information and go to Part 5.

PART 5 Consideration of Operational Benefits

YES NO *Would operational and/or delivery constraints in an area served with unlined canals or ditches be improved as a result of reduced conveyance seepage?*

[There may be areas within the district that are operationally constrained during the peak irrigation period and may realize benefits from reduced conveyance seepage. A survey of ditch tenders and waters users will assist in answering or justifying the response to this question. The operations supervisor or water master should also be questioned about the frequency and extent of water orders that must be prorated during peak demand periods. Water orders prorated because of demands in excess of system design capacities should not be considered as negatively impacted by conveyance seepage.]

If the answer above is YES, place a check in the box in Part 7 and go to Part 7.
If the answer above is NO and there is a check in any of the boxes in Part 7, go to Part 7.
If the answer above is NO and there are no checks in any of the boxes in Part 7, provide supporting information and go to Part 6.

PART 6 Surface Water Allocation Threshold

YES NO *Is the district's average annual surface water supply less than 50 percent of crop irrigation requirements?*

[An average surface water supply of less than 50% of the crop irrigation requirements implies that over half of the crop needs are met by non-district water supplies. Therefore, the availability and use of district surface water is supplemental to the use of other sources such as groundwater for meeting crop irrigation.]

YES NO *Does the district's firm surface water supply provide less than 25% of crop irrigation requirements?*

[Firm surface water is typically one that is reliable and storable. If the firm surface water supply represents less than 25% of crop irrigation needs, this indicates that additional non-storable surface water or groundwater would be needed for the remaining 75% of the crop irrigation needs. This type of water supply ratio between the firm district supply and the other water supplies indicates that the district is a conjunctive use district and the water users rely on the ability to recharge and extract groundwater within the service area. The district's ability to recharge the groundwater reservoir plays an important role in the conjunctive use program.]

YES NO *Is the ratio of the district's non-storable water supply contract to the firm water supply contract 3:1 or greater?*

[A ratio of 3:1 or greater of the district's non-storable to firm water supply contract quantities indicates that the firm surface water supply represents less than 25% of crop irrigation needs. As noted above, this also indicates that additional non-storable surface water or groundwater would be needed for the remaining 75% of the crop irrigation needs. This type of water supply ratio between the firm district supply and the other water supplies indicates that the district is a conjunctive use district and the water users rely on the ability to recharge and extract groundwater within the service area. The district's ability to recharge the groundwater reservoir plays an important role in the conjunctive use program.]

YES NO *Would reductions in conveyance losses significantly affect the district's ability to beneficially use the surface when it is available or recharge the groundwater reservoir with the available contract supply?*

[Lining or piping some or all of the unlined canal system may result in a reduction in the ability to recharge the groundwater reservoir with the available contract surface water supply. A surface water supply that is not

storable or reliable must be used when it is available. If the reductions in conveyance losses significantly impact the district's ability to significantly "sink" or beneficially use their surface water supply when it is available, then the district could be adversely affected. Supporting information should include a water balance within the district, the timing of the water needs, the timing and dependability of available water supply, and an estimate of the impacts. Alternative recharge methods and/or facilities should also be considered.]

If any of the answers above is YES, then provide supporting information. District is exempt from the implementation of canal lining/piping because of non-applicability.

If all of the answers above are NO, then go to Part 7.

PART 7 Summary Table and Benefit/Cost Analysis

Summary Table:

☐ Part 3: Majority of district does not overlie an unconfined aquifer or the groundwater is too deep to be economically extracted.

☐ Part 4: Seepage losses contribute to a salt sink or are lost from district boundary.

☐ Part 5: Operational constraints exist as a result of canal/pipeline seepage.

.....

Benefit/Cost Analysis:

Perform a benefit/cost analysis on the item(s) above that was identified as warranting further consideration for the implementation of the canal lining and/or piping best management practice. The canal(s) with the most potential for improvement should be identified and analyzed. The selection should be based in part on the problems identified above and the existing soil types and topography. Perform analysis in accordance with:

A. Methodology included in the AB3616 process (Attachment 1); or

B. Accepted engineering methods. The analysis should, at a minimum, include:

1. A description of the project(s) that would be required;

2. Listing of the work or materials required with estimated quantities and prices;

3. Estimated engineering, surveying and administrative costs;

4. Estimated contingency costs;

5. Total project costs annualized over the life of the improvements;

6. Estimated increases/decreases in maintenance costs;

7. Estimated cost of irrecoverable conveyance seepage and/or costs associated with exacerbation of drainage and salinity problems, if any;

8. Estimated benefits to operational constraints, if any;

9. Estimated benefits of reduced district groundwater pumping costs, if any; and

10. Estimated cost of conserved water per project on a per acre-foot basis.

Attachment 1

EXHIBIT E

NET BENEFIT ANALYSIS

FOR

EFFICIENT WATER MANAGEMENT PRACTICES

BY AGRICULTURAL WATER SUPPLIERS

AB 3616 Water Management Act of 1990

November 13, 1996

AS MODIFIED FOR

METHODOLOGY FOR DETERMINATING APPLICABILITY/IMPLEMENTATION
OF THE CANAL LINING/PIPING

April 2000

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PART 3

General Information for Detailed Analysis

Part 3 provides general information for the Canal Lining/Piping.

A. Does this Canal Lining/Piping **impact any of the other BMPs?**
____Yes ____No

If Yes, Discuss the expected impacts.

If No, Continue.

B. Complete the following matrix. Additionally, attach a description of how seepage flows were determined (e.g., consultant report, field study, water budget).

Estimated length of canals, ditches in service area (miles)	
Ditches/canals currently unlined (miles)	
Ditches/canals currently lined (miles)	
Pipelines in service area (miles)	
Potential average seepage flows from unlined ditches/canals (ac-ft/yr)	
Potential average recovered seepage flows from unlined ditches/canals (ac-ft/yr)	
Estimated average seepage flows which exit and are lost to service area (ac-ft/yr)	
Estimated average seepage flows which exit and are lost to the basin (ac-ft/yr)	
Estimated average seepage flows which exit and are lost to the saline sink (ac-ft/yr)	

C. Was Canal Lining/Piping **considered in coordination with any other BMPs or other neighboring water suppliers?**
____Yes ____No

If Yes, Describe the proposal(s) and continue.

If No, Describe the project(s) to be evaluated and continue.

PART 4

Environmental, Third Party, and Indirect Economic Analysis

Part 4 addresses potential environmental, third party, and indirect economic impacts for Canal Lining/Piping.

NOTE: For the following sections, any indeterminate effects on the environment or third parties may require further study.

The intent of this process is to be broad enough to encompass most scenarios that would exist in all water supplier service areas. However, if your interpretation of any potential effect for the following questions differs from the one stated, please feel free to attach an explanation for that particular question.

ENVIRONMENTAL EFFECTS

A. Source of Supply

Will implementation of canal lining/piping result in reduced water demand in the water supplier's service area?
____Yes ____No ____Unknown

If Yes, There may be a potential beneficial/negative impact, check the appropriate column on the Potential Environmental Effects Summary, Table 1, and attach a description of the intended use of the water (e.g. stored in reservoir, instream flows, etc.)

If No, Check Insignificant on Table 1, Potential Environmental Effects Summary.

If Unknown, Check Indeterminate on the Potential Environmental Effects Summary Table 1.

B. Confined/Unconfined Ground Water Levels

Are there any habitats in the water service area that are supported/supplied by existing groundwater levels?
____Yes ____No ____Unknown

If No, Check Insignificant on Table 1. Attach a description explaining why implementation will not result in reduced diversions.

If Unknown, Check Indeterminate.

If Yes, Will implementation of canal lining/piping affect the groundwater levels?
____Yes ____No ____Neither ____Unknown

If Yes, Check appropriate column on Table 1. Include a description of the habitat, and how the habitat would be impacted by changes in the groundwater levels.

If No or Neither, Check Insignificant on Table 1. Please attach a description of the habitat and estimated increased supply.

If Unknown, Check Indeterminate on Table 1.

C. Shallow Groundwater

Is the water supplier located in an area where shallow groundwater and/or water quality problems (i.e., salinity, selenium) limit the use of land and/or drainage water?
____Yes ____No ____Unknown

If Yes, Do you anticipate that shallow groundwater conditions will improve or degrade as a result of implementation of canal lining/piping?
____Improve ____ Degrade ____Neither ____Unknown

If Improve, Improved groundwater conditions should create an overall environmental benefit; check Beneficial. Please attach a description of improved conditions with respect to water levels and quality (in terms of TDS and/or known constituents of concern).

If Degrade, Check Negative. Please attach a description of the expected degraded conditions with respect to water levels and quality (in terms of TDS and/or known constituents of concern).

If Neither, Check Insignificant. Attach a description explaining why shallow groundwater will not be impacted.

If Unknown, Check Indeterminate.

If No, Check Insignificant.

If Unknown, Check Indeterminate.

D. Instream Flows

Does the water supplier's distribution system contribute to flows in any other water courses?
____Yes ____No ____Unknown

If No, Check Insignificant.

If Unknown, Check Indeterminate.

If Yes, Will implementation of canal lining/piping affect flows to any other water courses?
___Yes ____ No____ Neither ____Unknown

If Yes, Check appropriate column on Table 1. Include a description of the positive or negative impacts on the flows , and how the habitat would be impacted by changes.

If No or Neither, Check Insignificant on Table 1.

If Unknown, Check Indeterminate on Table 1.

E. <u>Drain Flows</u>

Does the water supplier's service area have drains that supply or support habitat?
____Yes ____No ____Unknown

If No, Check Insignificant.

If Unknown, Check Indeterminate.

If yes, Will these drain flows be reduced as a result of practices associated with canal lining/piping?
____Yes ____No ____Unknown

If Yes, there is a potential negative impact; check Negative and include a description on the adverse effects to any habitat.

If Unknown, Check Indeterminate.

If No, Do you anticipate that drain water quality will improve or degrade as a result of implementing canal lining/piping?
___Improve ___Degrade ___Neither ___Unknown

If Improve, Improved drain water conditions should create an overall environmental benefit; check beneficial. Please attach a description of improved conditions with respect to quality (in terms of TDS and/or known constituents of concern).

If Degrade, Check Negative. Please attach a description of the expected degraded conditions with respect to quality (in terms of TDS and/or known constituents of concern).

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

F. Fertilizer/Herbicide/Pesticide Use

Are pesticides/herbicides used to control vegetative growth or burrowing along ditches/canals?

____Yes ____No

If No, Check Insignificant.

If Yes, Will pesticide/herbicide use by the water supplier along ditches/canals be decreased or increased as a result of piping or lining?
____Decrease ____Increase ____Neither ____Unknown

If Neither, Check Insignificant on Table 1.

If Unknown, Check Indeterminate on Table 1.

If Decrease/Increase, There may be a potential impact on the environment. Please check the appropriate column on Table 1 and attach a description of the potential impacts of the increase/decrease in pesticide use.

G. <u>Soil Erosion</u>

Will implementation of canal lining/piping reduce the current amount of soil erosion in the water supplier service area?
____Yes ____No ____Unknown

If Unknown, Check indeterminate.

If Yes/No, There may be a potential impact on the environment. Please check the appropriate column on Table 1 and attach a description of the potential impacts of canal lining/piping.

H. <u>Field Burning and/or Fugitive Dust</u>

Is vegetation removed from canal banks by burning?
____Yes ____No

If No, Check Insignificant.

If Yes, Would this burning decrease as a result of lining or piping ditches/canals?
____Yes ____No ____Neither ____Unknown

If Yes/No, There may be a potential impact on the environment. Please check the appropriate column on Table 1 and attach a description of the potential impacts of canal lining/piping.

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

I. Energy Use

Would canal lining/piping increase or decrease energy use (e.g., pump use, canal structure controls, etc.)?
___Decrease ___Increase ___Neither ___Unknown

If Decrease, Less energy consumption and/or lower air emissions would be potential environmental benefits; check beneficial.

If Increase, Check Negative.

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

J. Do ditches/canals that might be considered for lining/piping supply or support any of the following habitats:

Yes	No	
___	___	Vernal pools and swales
___	___	Riparian
___	___	Open water bodies
___	___	Marshes (permanent or seasonal)

Please attach a description to any "Yes" answers to the previous question. Include in your description any known or potential sensitive plant and wildlife species in the habitat and the approximate size and location of the habitat. If the habitat is a series of smaller parcels (e.g., vernal pools) just describe the general location. Also identify your source of information. Finally, on Table 1 check whether you believe that the potential impact to the habitat would be beneficial, negative, insignificant, or indeterminate; attach a description and justification.

THIRD-PARTY EFFECTS

A. Confined/Unconfined Ground Water Levels

Will implementation of canal lining/piping affect groundwater elevations?
____Yes ____No ____Unknown

If Yes, Rise or fall of the groundwater levels could have potential benefit or negatively affect the third-party groundwater users in the basin; check appropriate column on Table 2, Potential Third-Party Effects Summary. Attach a description of the anticipated effect on groundwater levels and third-party users.

If No, Check appropriate column on Table 2. Attach a description as to why you expect groundwater levels to remain unchanged.

If Unknown, Check Indeterminate on Table 2.

B. Instream Flows

Do water supplier distribution flows contribute to any natural streams?
___Yes ___No ___Unknown

If No, Check Insignificant, go to C.

If Unknown, Check Indeterminate.

If yes, Will implementation of canal lining/piping decrease or increase instream flows to any streams that supply or support any third-party?
____ Decrease ____ Increase ____ Neither ____ Unknown

If Decrease, There may be a potential negative effect to third-party users; check Negative on Table 2. Include a description of the potential adverse effects on third-party users by reduced instream flows.

If Increase, Creating additional supplies may result in a benefit; check Beneficial. Please attach a description of the potential benefits and estimated increased supply.

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

C. Drain Flows

Do drain flows supply or support any third-party user?
____Yes ____No

If Yes, Do you anticipate that drain water conditions will be affected as a result of implementation of canal lining/piping?
____Yes ____No ____Unknown

If Yes, Improved or adversely affected drain water may have an overall benefit or detrimental effects to the third parties; check appropriate column on Table 2. Please attach a description of drain water conditions with respect to quality (in terms of TDS and/or known constituents of concern).

If No, Check appropriate column on Table 2. Please attach a description of the expected degraded conditions with respect to quality (in terms of TDS and/or known constituents of concern).

If Unknown, Check Indeterminate.

D. Herbicide/Pesticide Use

Are pesticides/herbicides used to control vegetative growth or burrowing along distribution system banks?
___Yes ___No

If No, Check Insignificant.

If Yes, Does water that flows through water supplier ditches or canals continue on to third-party users (such as M&I)?
____Yes ____No

If No, Check Insignificant.

If Yes, Will fewer pesticides/herbicides be applied by the agricultural water supplier as a result of implementing canal lining/piping?
___Yes ___No

If No, Check Insignificant.

If Yes, There may be a potential impact on third parties. Please check the appropriate column on Table 2 and attach a description of the potential impacts of canal lining/piping.

E. Wind/Water Soil Erosion

Will implementation of canal lining/piping reduce the current amount of soil erosion in the water supplier service area?
____Yes ____No ____Unknown

If Yes, There may be a potential impact on third parties. Please check the appropriate column on the Table 2 and attach a description of the potential impacts of canal lining/piping.

If No, Check insignificant.

If Unknown, Check indeterminate.

INDIRECT ECONOMIC EFFECTS

A. Will canal lining/piping affect local economies through changes in on-farm operations (indirect economic effects)?
___Yes ___No ___Unknown

If Yes, Please describe.

If No, Check Insignificant on Table 3, Potential Indirect Farm Production Effects Summary, Sections B, C, and D.

If Unknown, Check Indeterminate on Table 3, Sections B, C, and D.

B. Will practices associated with implementation of canal lining/piping increase or decrease farmers' purchases of crop inputs such as seed, fertilizer, irrigation equipment, etc.?
___Increase ___Decrease ___Neither ___Unknown

If Increase, There may be a potential benefit; check beneficial on Table 3, Section B.

If Decrease, There may be a potential negative effect; check Negative on Table 3, Section B.

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

C. Will practices associated with implementation of canal lining/piping increase or decrease the hiring of local (county) farm workers?
___Increase ___Decrease ___Neither ___Unknown

If Increase, There may be a potential benefit; check beneficial on Table 3, Section C.

If Decrease, There may be a potential negative effect; check Negative.

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

D. Will practices associated with the implementation of canal lining/piping increase or decrease the local (county) processing of farm produce (examples--canning of nuts, fruits, and vegetables; milk production supported by cows/pasture; etc.)?
___Increase ___Decrease ___Neither ___Unknown

If Increase, There may be a potential benefit; check Beneficial on Table 3, Section D.

If Decrease, There is a potential negative effect; check Negative.

If Neither, Check Insignificant.

If Unknown, Check Indeterminate.

Table 1. Potential Environmental Effects Summary

Section	Evaluated Component	Beneficial	Negative	Insignificant	Indeterminate
A	Source of Supply				
B	Confined/Unconfined Groundwater Levels				
C	Shallow Groundwater Elevations				
D	Instream Flows				
E	Drain Flows				
F	Fertilizer/Herbicide/ Pesticide Use				
G	Soil Erosion				
H	Field Burning and Fugitive Dust				
I	Energy Use				
J	Vernal Pools and Swales				
	Riparian Habitat				
	Open Water Bodies				
	Marshes (permanent or seasonal)				

Table 2. Potential Third-Party Effects Summary

Section	Evaluated Component	Beneficial	Negative	Insignificant	Indeterminate
A	Confined/Unconfined Ground Water Levels				
B	Instream Flows				
C	Drain Flows				
D	Herbicide/Pesticide Use				
E	Wind/Water Soil Erosion				

Table 3. Potential Indirect Farm Production Effects Summary

Section	Evaluation Component	Beneficial	Negative	Insignificant	Indeterminate
B	Farm Inputs				
C	Local Farm Labor				
D	Processing of Farm Produce				

PART 5

Canal Lining/Piping Economic Analysis

Part 5 evaluates the economic benefits and costs of canal lining/piping. Worksheets 1 through 4 enable the water supplier to develop a benefit/cost (B/C) ratio for canal lining/piping from the water supplier perspective.

Worksheet 1. Canal Lining/Piping Water Supplier Effects

. **How much water is estimated to be conserved annually as a result of canal lining/piping?**

_____acre-feet

Please discuss your assumptions and methodology for deriving this estimate.

. **Does canal lining/piping result in water supplier capital costs and/or annual operation and maintenance costs?**

___Yes ___No ___Unknown

If Yes, Please complete Worksheet 2 and continue.

IF No or Unknown, Please describe.

. **Would canal lining/piping reduce current water supplier water purchases, water diversions, and/or groundwater pumping?**

___Yes ___No ___Unknown

If Yes, Please complete Worksheet 3a and continue.

. **Would canal lining/piping delay or eliminate the need to complete future water supply augmentation and/or distribution projects?**

___Yes ___No ___Unknown

If Yes, Please complete Worksheet 3b.

. **Would canal lining/piping result in additional sales of water supplies to existing customers, new customers, and/or other agencies?**

___Yes ___No ___Unknown

If Yes, Please complete Worksheet 3c.

Worksheet 2. BMP Water Supplier Costs

2a. BMP Water Supplier Capital Costs

Complete the following worksheet for BMP capital costs:

Capital Cost Category (a)	Item (b)	Cost (c)	Contingency Cost Percent (d)	Contingency Cost Dollars (c x d) (e)	Subtotal (c + e) (f)
Planning			**0.15**		
Land			**0.15**		
Structures			**0.15**		
Equipment			**0.15**		
Mitigation			**0.15**		
Other			**0.15**		
Subtotal Capital Costs					
Deduct Expected Salvage Value After 25 Years					
Total Capital Costs					
Capital Recovery Factor (6%, 25 Years)					**0.0782**
Annual Capital Costs (Total Costs x CRF)					

Enter Annual Capital Costs into Worksheet 2c, Column (a).

2b. Canal Lining/Piping Water Supplier Annual O&M Costs

Complete the following worksheet for canal lining/piping annual O&M costs:

Annual Operating Costs (a)	Annual Maintenance Costs (b)	Annual Other Costs [1] (c)	Total O&M Costs (a + b +c) (d)

[1]Other annual costs not included in O&M, such as annual environmental mitigation costs.

Enter Total O&M Costs into Worksheet 2c, Column (d).

2c. Canal Lining/Piping Water Supplier Costs/AF Summary

Complete the following worksheet for BMP cost/af summary:

Annual Capital Costs[1] (a)	Annual O&M Costs[2] (b)	Total Annual Costs (a + b) (c)	Annual Conserved Water[3] (AF) (d)	Cost/ AF (c/d) (e)

[1]From Worksheet 2a.
[2]From Worksheet 2b.
[3]From Worksheet 1.

Enter the cost/af onto Worksheet 4, canal lining/piping Cost**.**

Worksheet 3. Canal Lining/Piping Water Supplier Benefits

Note: The value of the conserved water to the water supplier is determined by how the conserved water is used. If the conserved water allows the water supplier to reduce the amount of water purchased, diverted or pumped, then the value is equal to the avoided cost of obtaining water from the supplier's most expensive current water source. However, if the water supplier needs to augment water supplies to meet future demands, then the value to the water supplier is measured by the least-cost alternative that can be eliminated or delayed because of canal lining/piping. Finally, if the water supplier plans to sell all or part of the conserved water to existing customers, new customers or other agencies, then the value can be measured by the price for which it is sold, thus generating additional revenue. Choose the most appropriate method.

3a. Water Supplier Avoided Costs--Current Sources

Complete the following worksheet for current sources of supply that would be avoided with the implementation of canal lining/piping:

Sources of Supply Avoided (a)	Amount of Water (af) (b)	Annual O&M Costs ($/af) (c)	Source to be Used as Benefit Measure (d)

Enter the avoided cost ($/af) from the sources selected into Worksheet 4, canal lining/piping Benefit**.**

3b. Water Supplier Avoided Costs--Future Sources

Complete the following worksheet for future sources eliminated or delayed because of implementation of canal lining/piping:

Alternative (a)	Total Capital Costs (b)	Capital Recovery Factor[1] (c)	Annual Capital Costs (b x c) (d)	Annual O&M Costs (e)	Total Annual Costs (d + e) (f)	Annual Yield (g)	Cost/af (f / g) (h)
		0.0782					
		0.0782					
		0.0782					
		0.0782					

[1]For a 25-year period with 6% discount rate.

Which alternative is to be selected as benefit measure? Explain:

Enter the cost/af value for alternative selected into Worksheet 4, canal lining/piping Benefit.

3c. Water Supplier Revenue Effects

Complete the following worksheet:

Parties Purchasing Conserved Water (a)	Amount of Water (af) (b)	Selling Price ($/af) (c)	Expected Frequency of Sales (%)[1] (d)	Expected Selling Price ($/af) (c x d) (e)	"Option" Fee ($/af)[2] (f)	Total Selling Price ($/af) (e + f) (g)

[1]During a 25-year analysis period, how many years are water sales expected to occur? For example, water sales to farmers might be expected to occur 90% of the years, whereas the frequency to other agencies might be 50% of the years.

[2]"Option" fees are paid by a contracting agency to a selling agency to maintain the right of the contracting agency to buy water whenever needed. Although the water may not be purchased every year, the fee is usually paid every year.

Enter the expected selling price (revenue) into Worksheet 4, canal lining/piping Benefit.

Worksheet 4. Canal Lining/Piping Water Supplier Benefit/Cost Ratio

Complete the following worksheet:

Benefits and Costs	
Canal Lining/Piping Benefit ($/af)[1]	
Canal Lining/Piping Cost ($/af)[2]	
Benefit/Cost Ratio	

[1]From Worksheet 3a, 3b or 3c.

[2]From Worksheet 2.

Part 6

Canal Lining/Piping Financial Analysis

A water supplier may claim an exemption if:

"Adequate funds (including funds from other beneficiaries of the plan) are not available, and cannot reasonably be expected to be made available, for implementation of canal lining/piping during the term of the plan." (MOU, Section 4.02)

If water supplier is claiming an exemption based upon the lack of available funding, please discuss the reasons for this finding. Please include a copy of your latest financial statement and a list of other potential plan beneficiaries who have been contacted.

Part 7

Summary of Analysis

Potential Environmental Effects Summary Table (from Part 4)

Section	Evaluated Component	B	N	I	IN
A	Source of Supply				
B	Confined/Unconfined Groundwater Levels				
C	Shallow Groundwater Elevations				
D	Instream Flows				
E	Drain Flows				
F	Fertilizer/Herbicide/Pesticide Use				
G	Soil Erosion				
H	Field Burning and Fugitive Dust				
I	Energy Use				
J	Vernal Pools or Swales				
	Riparian Habitat				
	Open Water Bodies				
	Marshes (permanent or seasonal)				
TOTALS					

Potential Third-Party Effects Summary Table (from Part 4)

Section	Evaluated Component	B	N	I	IN
A	Confined/Unconfined Groundwater Levels				
B	Instream Flows				
C	Drain Flows				
D	Herbicide/Pesticide Use				
E	Wind/Water Soil Erosion				
TOTALS					

Indirect Economic Effects Summary Table (from Part 4)

Section	Evaluated Component	B	N	I	IN
B	Farm Inputs				
C	Local Farm Labor				
D	Processing of Farm Produce				

TOTALS					

Canal Lining/Piping Economic Analysis (from Part 5)

Enter Water Supplier B/C Ratio	

Canal Lining/Piping Financial Analysis (from Part 6)

	Yes	**No**
Can adequate funding be expected to be made available?		

	Yes	**No**
Is Canal Lining/Piping accepted?		

Please provide here and in the plan a discussion of why canal lining/piping is accepted or rejected for implementation. Please include a discussion of estimated water savings, environmental effects, third-party effects , etc. for canal lining/piping.